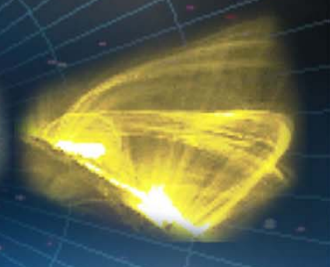
BEYOND EINSTEIN: From the Big Bang to Black Holes

Constellation-X

The Constellation X-Ray Mission



TLRD, SRD, Science White Papers: Update

Presented by

Michael Garcia (SAO)

Facility Science Team Meeting (FST)
December 18 – 20, 2006/Goddard Space Flight Center

TLRD Update

- **The Top Level Requirements Document**
  - **Has been presented and commented on by FST**
  - **First draft in 2000**
  - **TRIP (2003) version finalized in 2005**
- **Reasons to Update**
  - **Current version has some configuration specific items**
    - **4 separate spacecraft**
    - **40,000 c/s full energy resolution highest count rate limit**
    - **High rate limit quoted at ~1/4 Crab equivalent for high and low energy bands – distinguishing is a configuration specific artifact.**

TLRD Update

- Project Draft – YOUR comments solicited throughout this meeting and additional feedback requested by Jan 3
- 4 spacecraft -> multiple telescopes (now one s/c, 4 telescopes)
- 40,000 c/s in XRS -> ¼ Crab = 9e-9 ergs/cm^2/s (2-11 for α=2 spectrum)
- High rate dead time should include possible telemetry saturation effects
- Area at high energy (10-40) = 1,500cm^2 -> 1,500cm^2 (TBR)
  - As the BH science may be possible with more area at lower E, and less at higher E
  - As the SEPs may not provide 1500cm^2 area at 40keV, but also may extend the bandpass to higher E with lower area
- FOV at high energy
  - Was >8 arc-min – now >2.5 arc-min (same as low E)
  - Several HXT SEPs utilize enhanced SXT optics and detector integrated with XRS
  - Approximately same number of BG/Source detect cells
- TLRD will be provided to BEPAC on Jan 15.
- Updated TLRD Available for your comments on the Con-X Web site
  - Location same as this meeting announcement, SEP Response Matrices

Science Requirements Document (SRC) Update

- Purpose is to document science objectives and flow-down to mission science measurement requirements
- Draft started June 2005 (shortly after Science Booklet finished)
- Structure and Outline presented at Feb 06 FST
- Outline based on May 05 'Science w/ Con-X' Booklet
- Draft ~½ done – effort re-directed to BEPAC
  - Strong Gravity, Black Holes Section Drafted
  - Dark Energy, Dark Matter (WHIM) Section Drafted
  - Cosmic Feedback, Large Scale Structure Section partially Drafted
  - Life Cycles of Matter, Matter Under Extreme Conditions – not Drafted
- SRD Not required until we enter Phase A
- WILL be required when we come out #1 in BEPAC!
- Considering supplying DRAFT to BEPAC – comments?

Science White Papers Status

- Why update May 2005 'Science with Con-X'?
- Drafted largely in 2004 – 2 years of discoveries to include!
- Need to evaluate science with baseline SXT/XRS
- Need to evaluate science enabled with SEP
- Need to prepare for BEPAC Science Presentations
- Product aimed at BEPAC evaluation criteria (somewhat unclear)
- Based on May 2005 Booklet – Update, not entirely new product

Science White Papers Status

- **Supermassive Black Holes, GR, BH Spin:** C. Reynolds (UMd)
  - Andy Fabian, James Reeves, Mitch Begelman, Jon Miller, Kim Weaver, Tod Strohmayer
  - On draft 3
  - New Items (partial list):
    - Review of Past Successes: Black Holes discovered, pervasive throughout universe
    - Simulations/Calculations including viscous stress and radiation pressure effect on orbital dynamics of GR 'test particles'
    - Simulations using different telescope area at high energies
    - Simulations of number of spins vs z that will be found, and spin accuracy
  - Talks by Reynolds, Reeves, and Turner this afternoon

Science White Papers Status

- **Galaxy Clusters, Feedback, BH Evolution:** R. Mushotzky (GSFC)
  - Feedback – Richard Mushotsky, Andy Fabian, Phil Hopkins
  - DE/DM – Mark Bautz, Steve Allen, Alexey Vikhlinin, Maxim Markevitch, David Rapetti
  - BH Evolution – David Alexander, Gordon Richards, Neil Brandt
  - On Draft 1
  - New Items (partial list):
    - Review of Past Successes: σ_8, DE/DM measurements, Bullet Cluster
    - Improved simulations for f(gas) measurements
    - Expanded G(z) section
    - Expanded S-Z section
    - Expanded Dark Matter Section (sterile neutrino)
  - Talks by Richards (this PM), Allen/Rapetti, Vikhlinin, Bautz, Mushotzky, Abazajian (tomorrow AM)

Science White Papers Status

- **Supernova Remnants:** J. Hughes (Rutgers)
  - Carlos Badenes, Frits Paerels, Una Hwang, Norbert Schulz, Randall Smith, Wilt Sanders, Rob Petre
  - Hughes talk Wed PM
- **Warm-Hot IGM:** J. Bregman (UMich)
  - Randall Smith, Fabrizio Nicastro, Frits Paerels, Smita Mathur
  - On Draft 2
  - New Items
    - Discussion of Chandra/XMM results
    - Scaling improvement factor ~ R*A^1/2, Con-X w/ 1eV at 0.6 keV gives 20 to 40x improvement
  - Talks by Bregman and Smith this PM

Science White Papers Status

- **Neutron Stars & Fundamental Physics:** T. Strohmayer (GSFC)
  - Deepto Chakrabarty, David Kaplan, Frits Paerels, Jean Cottam, Jon Miller, George Pavlov
  - On draft 2
  - New items (partial list):
    - Isolated NS as EOS probes
    - Updated (improved) Bursting NS/EOS measurements
    - Comparisons to ground based collider capabilities
  - Talks by Strohmayer and Bhattacharyya Wed PM
- **Stars, Life Cycles of Matter:** J. Drake (SAO):
  - Nancy Brickhouse, Norbert Schulz, Eric Feigelson, Rachel Oston
  - On Draft 1
  - Talks by Drake and Osten this PM

Science White Papers Update

- DEADLINE: Jan 19 !!
- Plan to deliver to BEPAC on or before Jan 30 (next meeting)

- RFI – 36 questions
- BEPAC wants by Jan 22